Systems versus Classical Approach to WARFARE

By MILAN N. VEGO

U.S. Air Force (Scott T. Sturkol)

U.S. and Australian officers helping to shape strategic planning in Global Mobility Wargame 2008

Since the mid-1990s, a systems (or systemic) approach to warfare emerged gradually as the dominant school of thought in the U.S. military, most other Western militaries, and the North Atlantic Treaty Organization (NATO). This was exemplified by the wide and almost uncritical acceptance, not only in the United States but also in other militaries, of the claims by numerous proponents of the need to adopt network-centric warfare (NCW), effects-based operations (EBO), and most recently a systemic operational design (SOD). Yet little if any attention was given to some rather serious flaws in the theoretical foundations of various systems approaches to warfare. Classical military thought was declared unable to satisfy the requirements of the new environment that emerged in the aftermath of the Cold War and the advent of advanced information technologies and increasingly lethal and precise long-range weapons. Carl von Clausewitz's (1780–1831) ideas on the nature of war were ignored. Yet U.S. and NATO experiences in the recent conflicts in Afghanistan and Iraq, and the Israeli experience in the second Lebanon war in 2006, have revealed not only serious limitations but also important flaws in the practical application of the systems view of war. These conflicts have shown the timeless value of the Clausewitzian view of warfare. The future might well show that most efforts and resources spent on adopting a systems view of warfare were essentially wasted.

Never neglect the psychological, cultural, political, and human dimensions of warfare, which is inevitably tragic, inefficient, and uncertain. Be skeptical of systems analysis, computer models, game theories, or doctrines that suggest otherwise.

—Secretary of Defense Robert Gates[1]

Pilots attending Red Flag Mission Debriefing System session receive instant feedback on training

U.S. Air Force (Don Sutherland)

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The Roots

The military application of a systems[2] approach to planning can be traced to the 1930s when U.S. Army Air Corps planners at the Air Corps Tactical School in Langley, Virginia, developed the theory of strategic bombing. U.S. airpower theorists believed that the main threads of the enemy economy could be identified and evaluated *prior* to the outbreak of hostilities. This so-called industrial web theory focused on those critical industries upon which significant portions of an enemy war economy relied.[3] The intent was to use a systems approach to generate cascading effects that would lead to the collapse of the enemy's economy. The ultimate aim was to reduce the enemy's will to resist and force him to cease fighting. According to this view, the proper application of industrial web theory would ensure rapid and decisive victory.[4]

Industrial web theory was applied on a large scale during World War II in the strategic bombing of Germany, German-occupied Europe, and Japan. However, the actual results were far below expectations in terms of materiel and time expended. Germany's industrial infrastructure proved resilient and extremely adaptable, and civilian morale did not collapse, as widely anticipated by airpower proponents. Some 5 years of strategic bombing destroyed entire cities, killed hundreds of thousands of civilians, curtailed industrial output, and crippled transportation nodes. Yet despite the enormous effect, such effects-based operations failed to render a strategic decision.[5]

The impetus toward adopting an effects-based approach came in the aftermath of the Vietnam War (1965–1975). Then, the U.S. military emphasized the need to link objectives at all levels of war—from the national political level to the tactical—in a logical and causal chain. In their interpretation, this outcome-based or strategy-to-task approach became the basis for joint planning. The Air Force firmly believed that its targeteering approach to warfare could somehow be applied at all levels of war. The most vocal proponents of airpower claimed that advances in information technologies and the precision and lethality of weapons allowed the use of those weapons against complex systems and in a way that was more sophisticated than previously. Another reason for the reemergence of the effects-based approach was the political and social pressure to reduce the costs of military operations and wage war with the fewest losses of human lives for the friendly (and often the enemy) side.[6] Such beliefs gained increasing influence, not only within the Air Force but also among the highest U.S. political and military leadership.

The theoretical foundation of effects-based warfare was provided in 1993 in the writings of Colonel John Warden III, USAF, and his theory of strategic paralysis. Warden depicted the enemy as a system of systems.[7] He also pointed out the relative nature of effects within the enemy system.[8] In Warden's view, to think strategically was to view the enemy as a "system" composed of numerous subsystems.[9] He contended that all systems are similarly organized, need information to function, are resistant to change, and do not instantly react to the force applied against them (the hysteresis effect).[10]

The essence of Warden's systems approach is the Five Ring Model. He argued that any modern state, business organization, military, terrorist organization, or criminal gang can be seen as consisting of a system of five interrelated rings that enable it to perform its intended function.[11] All systems are arranged in the same way:

- "leadership" elements provide general direction
- "processes" (formerly called "organic essentials") elements convert energy from one ring to another
- "physical infrastructure" elements
- "population" elements
- "agents" (formerly called "fielded forces") elements, consisting of demographic groups.[12]

Warden also applied his model to the operational level of war. The only difference is that each of the rings pertains directly to military sources of power. For example, the leadership ring consists of the enemy's commander plus the command, control, and communications systems. The processes ring also includes military logistics. The infrastructure ring includes roads, rails, communications lines, and pipelines. The fifth ring is the enemy's forces—troops, ships, and aircraft—and is the hardest to reduce. Warden asserted that any campaign focused on the fifth ring would be the longest and bloodiest for both sides. Yet he acknowledged that sometimes it is necessary to concentrate on the fifth ring to reduce it to some extent in order to reach inner operational or strategic rings.[13] The Air Force gradually embraced Warden's model.[14]

Systems View of the Military Situation

EBO advocates have a radically different view of analyzing the military situation from proponents of the traditional approach based on the commander's estimate (or appreciation) of the situation. Proponents of EBO insist that the best way to visualize the military situation is to evaluate what they call a "system of systems." The latter is, in its essence, a variation of the Five Ring Model. In an oddly worded construct, they define *system of systems* as "a grouping of organized assemblies of resources, methods, and procedures regulated by interaction or interdependence to accomplish a set of specific functions."[15] Both Joint Publication (JP) 3–0, *Joint Operations* (2006), and JP 5–0, *Joint Operation Planning* (2006), embraced the system perspective in analyzing situations. A system of systems is an integral part of what EBO proponents call the "operational environment." The latter, in turn, is composed of "air, land, sea, space, and associated adversary, friendly, and neutral systems, which are relevant for specific joint operations."[16]

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A system of systems analysis (SoSA) is used as the bedrock for EBO planning. It is divided into six major systems: political, military, economic, social, infrastructure, and information.[17] Each of these systems, in turn, is broken down and reduced to two primary sets of elements: nodes (actually decisive points) and links. *Nodes* are tangible elements (persons, places, or physical things) within a system that can be "targeted." *Links*, in contrast, are the physical, functional, or behavioral relationships between nodes.[18] SoSA identifies the relationships between nodes within individual systems and across systems. Analysts also link nodes to each other with sufficient detail and then determine *key nodes*—defined as those "related to strategic or operational effect or a center of gravity." Some nodes may become decisive points for military operations when acted upon.[19] EBO

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proponents confuse the true meanings of effects, centers of gravity, and decisive points.

SoSA produces a nodal analysis that, together with effects development, forms the basis for coupling nodes to effects, actions (called *tasks* in the traditional military decisionmaking and planning process) to nodes, and resources to establish effects-nodes-action linkages. The nodes and associated links are then targeted for diplomatic, informational, military, and economic (DIME) actions to influence or change system behavior and capabilities and thereby accomplish desired objectives. Lethal or nonlethal power and other instruments of national power are employed to affect links in order to attain operational and strategic effects.[20] The aim is to create effects within the enemy's system such as blindness, decapitation, and the sense of pursuit, thereby bringing about a state of strategic paralysis, collapse, and ultimately accomplishing the war's strategic objective.[21] However, EBO enthusiasts do not make clear who has the authority and responsibility to plan and execute DIME actions. Some of them even imply that these actions are the responsibility of the operational commanders—but they are not. Only the highest political-strategic leadership of a country or alliance/coalition can plan for and execute synchronized employment of both nonmilitary and military instruments of power.

EBO advocates are confident that by acting against a physical part of the enemy system, desired effects in the domain of human activity can be achieved. Yet this is a highly dubious proposition. They mistakenly believe that by linking cause and effect, something as complex as human activity can be reduced to an essentially passive and lifeless domain. In fact, the reality depicted by EBO proponents does not exist—nor can it be created.[22] In short, human activity is so complex that it operates outside the physical domain. For instance, the Israelis adopted the U.S. effects-based approach to warfare with a great deal of enthusiasm and apparently without a healthy dose of skepticism. Among other things, they neglected the importance of the concept of center of gravity. Instead of issuing clear and succinct orders, advocates relied on the highly ambiguous and unclear vocabulary of EBO in articulating the missions for subordinate units. For example, the orders issued to the Israeli 91st Division during the second Lebanon war in 2006 (Operation *Change of Direction*) directed them to carry out "swarmed, multi-dimensional, and simultaneous attacks" instead of stating clearly what the mission was. Already in 2004, the Israelis found out that in order to stop the launching of rockets into Israeli territory, it was necessary to affect enemy *capabilities* rather than *consciousness*. During the second Lebanon war, so-called leverage and effects against Hizballah proved dismally ineffective to bring the organization "to acknowledge its bad condition" within a few days after the conflict started.[23]

Another variant of the systems approach that unfortunately got some traction in the U.S. Army, so-called systemic operational design, also looks at the situation from the systems perspective. This concept originated in the Israel Defense Forces Operational Theory Research Institute in the mid-1990s. The genesis for SOD theory was found within Soviet operational thought.[24] Another major influence on the development of this concept was the thinking of several (mostly left-leaning) French postmodern philosophers, especially Gilles Deleuze (1925–1995) and Felix Guattari (1930–1992). Proponents explain that systemic operational design was developed as an alternative to the Western teleological approach, while operational design is based on epistemology.

In contrast to EBO advocates, SOD advocates acknowledge that uncertainty is an attribute of complex adaptive systems, such as war. They addressed that problem by employing what they call continuous *systems reframing*—an awkward term—which traditionalists simply call the "running estimate of the situation." SOD enthusiasts insist that while the EBO approach focuses on disrupting nodes and relationships, systemic operational design centers on transforming relationships and interactions between the entities within a system.[25] Like the effects-based approach, systemic operational design also analyzes a complex situation from what they call a "holistic" (that is, emphasizing the importance of the whole and interdependence of its parts) perspective.[26] SOD enthusiasts claim that modern military operations are too complicated for applying a linear approach because the enemy and environment form a complex adaptive system. However, they mistakenly argue that such systems cannot be destroyed but must be pushed into disequilibrium—that is, into chaos. Yet the Israeli failure to decisively defeat the Hizballah forces in the second Lebanon war illustrates the hollowness of both the EBO and SOD approaches to warfare.[27]

SOD proponents falsely claim that intelligence preparation of the battlefield (IPB) is most suitable for the tactical but not higher levels of war. In their view, IPB deals only with physical reality. Its mechanistic and reductionist processes are more appropriate

Army Chief of Staff GEN Casey tours Anniston Army Depot

U.S. Army (D. Myles Cullen)

EBO enthusiasts do not make clear who has the authority and responsibility to plan and execute DIME actions

in hierarchical organizations and in situations where compliance is more important than time-consuming discourse. In their view, IPB is insufficient for operational planning in the contemporary operational environment. SOD proponents argue that the operational level deals with more than just the physical enemy; it draws on concepts and abstractions.[28] However, IPB properly understood and applied is not what systems proponents claim it to be; in fact, it is just the opposite. IPB encompasses a comprehensive analysis of the situation regardless of the level of war. Properly understood, it includes the evaluation of neither military nor nonmilitary aspects of the situation.

Systems vs. Operational Thinking

Systems thinking has been developed to provide techniques for studying systems in a holistic way to supplement the traditional reductionist method. The principle of analytical reduction characterizing the Western intellectual tradition came from René Descartes (1596–1650). This type of analysis is the process of identifying the simple nature in complex phenomena and dividing each problem into as many parts as possible to best solve it. Experience has shown that reductive analysis is the most successful explanatory technique ever used in science.[29]

Systems thinking approaches a system in a holistic manner. The system is understood by examining the linkages and interactions between the elements that compose the entirety of the system. Systems thinking attempts to illustrate that events are separated by distance and time and that small catalytic events can cause large changes in complex systems. Supposedly, it contrasts traditional analysis, which studies systems by breaking them down into separate elements. Systems thinking provides a framework where mental models can be built, relationships between systems components can be uncovered, and patterns of behavior can be determined. Both the relationships within the system and the factors that influence them enable the construction and understating of the underlying system logic. Proponents claim that systems thinking views a system from the broad perspective that includes seeing its structure, patterns, and cycles rather than seeing individual events. The component parts of a system can best be understood in the context of relationships with each other and with other systems, rather than in isolation.[30]

The systems perspective in analyzing a military situation is actually reductionist and overly simplistic. Systems do not behave exactly as individual components, or even as a quantitative sum of individuals; the general performance and function of a system usually produce results considerably different from that of the arithmetical-linear summation of results of the individual ingredients that compose it.[31] Advocates of the systems approach seek scientific certainties and rationality where uncertainty, chaos, and irrationality abound. They assume that all elements of the situation can somehow be precisely determined and no mistakes will be made. The enemy is essentially passive and will behave in a way that will ensure friendly success. This view of warfare is overly simplistic because it does not accommodate the Clausewitzian factors of the friction and fog of war and the role of psychological factors in warfare.

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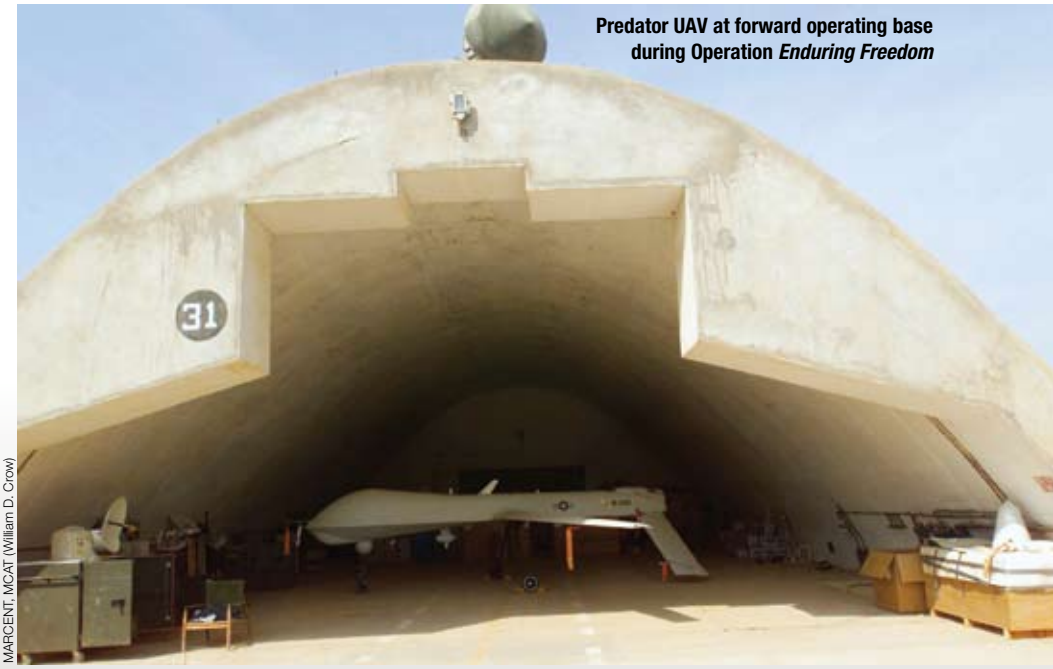

Predator UAV at forward operating base during Operation *Enduring Freedom*

MARCENT, MCAT (William D. Crow)

A more serious problem is that proponents of the systems approach ignore the fact that the tangible and intangible elements of the situation cannot simply be reduced to nodes and links. The human factor is the key element in analyzing the situation at any level of war, but especially at the strategic and operational levels, that is, those levels at which a war is won or lost. The higher the level of war, the more complex the interplay is among various intangible elements. Both the tangible and intangible elements of the situation include military and nonmilitary sources of power. The tangible elements are for the most part measurable in some way. Despite the widely held belief that tangible elements can be quantified, this is not always the case. The tangible and intangible elements are usually mixed and cannot be neatly separated. This is especially true in the case of forces employed at operational and strategic levels. Tangible factors can be properly or improperly evaluated, they can change over time, and they can be intentionally or inadvertently reported erroneously. They can be wrongly understood because of fear, hate, lack of confidence, fatigue, and stress.

Tangible elements can also be falsely evaluated. For example, the number or size of enemy forces or weapons/equipment might be accurately observed but falsely reported or evaluated without a context. Information received might be accurate but wrongly interpreted by commanders and staffs. This can occur intentionally or unintentionally. It can be caused by incompetence, lack of operations security, or treason. The commander can falsely evaluate the enemy's capabilities or intentions. Misunderstandings between commanders

and subordinates are frequent occurrences in combat; they cannot be predicted or quantified. The breakdown of weapons or technical equipment can occur at any time. The effects of atmospheric influences cannot usually be measured precisely. Except in rare cases, natural events cannot be predicted in a timely fashion. Hence, the unreliability of humans and technology considerably affects performance on both sides in a conflict. The boundaries between tangible and intangible factors are in the realm of chance and are fluid.[32]

In contrast to tangibles, intangibles are hard or even impossible to quantify with precision. Intangibles pertain for the most part to human elements. Some of these, such as cohesion of an alliance/coalition, public support for war, morale and discipline, and unit cohesion, can be evaluated in very broad terms: low, medium, high, or excellent. Other intangible elements—such as leadership, will to fight, small-unit cohesion, combat motivation, and doctrine—are extremely difficult to quantify with any degree of precision or confidence. At the strategic level, the quality of the enemy's highest political and military leadership and its future intentions and reactions are difficult, if not impossible, to evaluate and even less so to predict with confidence. The enemy's leadership can make decisions that are perceived as slightly or grossly irrational.

The traditional way of military thinking is not only far more comprehensive but also far more realistic, dynamic, and flexible than systems thinking. It avoids all the pitfalls associated with viewing a war through systems-of-systems prisms. One of the principal requirements for success at the operational and strategic levels of command is to think broadly and have a panoramic vision.[33] Operational thinking is not identical to what information warfare advocates call situational awareness—a term used in training pilots; strictly defined, *situational awareness* refers to the degree of accuracy with which one's perception of the current environment mirrors reality. Situational awareness does not necessarily mean an *understanding*; it is purely a tactical, not operational or strategic, term. The extensive use of the term *situational awareness* in the U.S. and other militaries is perhaps one of the best proofs of the predominance of a narrow tactical perspective among information warfare advocates.

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The commander's ability to think operationally, or what the Germans call operational thinking (*operatives Denken*), is usually not an innate trait but is acquired and nurtured for many years prior to assuming a position of responsibility at the operational level. The requirement to think operationally has been recognized by many theorists and practitioners of operational warfare. For example, the Prussian general Gerhard Johann David von Scharnhorst (1755–1813) observed that "one has to see the whole before seeing its parts. This is really the first rule, and its correctness can be learned from a study of history."[34] Clausewitz wrote that "small things always depend on great ones—the unimportant on the important, and accidentals on essentials; this must guide our approach."[35] Helmuth von Moltke, Sr. (1800–1891), the Prussian and German Chief of General Staff (1857–1888), wrote, "All individual successes achieved through the courage of our [German] troops on the battlefield are useless if not guided by great thoughts and directed by the purpose of the campaign and the war as a whole."[36] He believed that "it is far more important that the high commander retain a clear perspective of the entire state of affairs than that any detail is carried out in a particular way."[37]

Operational thinking is a result of considerable conscious effort on the part of the commander, in both peacetime and combat. Although operational thinking is one of the most critical factors for success, whether in peacetime or time of war, many operational commanders have remained essentially captives of their narrow tactical perspective. To think tactically is easy; it is an area in which all commanders feel comfortable because this is what they have done for most of their professional careers. History provides numerous examples in which a commander's inability or unwillingness to think broadly and far ahead resulted in major setbacks, or even in the failure of a campaign or major operation.

A commander thinks operationally when he possesses an *operational* rather than tactical perspective in exercising his numerous responsibilities, both in peacetime and in war. In purely spatial terms, the operational perspective encompasses the (formally declared or undeclared) theater of operations plus an arbitrarily defined area of interest. The perspective of a tactical commander is much smaller because he is focused on planning and executing actions aimed at accomplishing tactical objectives in a given combat zone or area of operations. The broadest perspective is required at the military and theater-strategic levels of command. Among other things, the strategic perspective requires the commander's ability to translate objectives of national policy and strategy into achievable military or theater-

USS *La Jolla* returns to Naval Station Pearl Harbor from 6-month Pacific deployment

U.S. Navy (Luciano Marano)

strategic objectives and then to orchestrate the use of military and nonmilitary sources of power to achieve them. The tactical commander is normally not concerned with using nonmilitary sources of power, but operational and strategic commanders are. However, the exception to this is operations short of war, such as the posthostilities phase of a campaign and low-intensity conflicts, where nonmilitary aspects of the situation play an important role at all levels of war.

Operational commanders cannot be highly successful without having full knowledge and understanding of the mutual interrelationships and linkage between strategy and policy on one hand, and strategy, operational art, and tactics on the other. They should fully understand the distinctions among the levels of war and how decisions and actions at one level affect events at others. In sequencing and synchronizing the use of military and nonmilitary sources of power, operational commanders must have the ability to focus on the big picture and not be sidetracked by minor or unrelated events.

An operational commander should also possess extensive knowledge and understanding of nonmilitary aspects of the situation in his theater. In contrast to the tactical commander, the operational commander has to properly sequence and synchronize the employment of all sources of power in the conduct of a campaign or major operation. Sound operational decisions must be made, although the knowledge and understanding of some essential elements of the situation are far from satisfactory and uncertainties abound. There is greater uncertainty for the operational commander than for a tactical commander in terms of space, time, and forces. Generally, a commander can more accurately measure the risks of an action or nonaction at the tactical than at the operational level.[38]

The operational commander has to properly balance the factors of space, time, and forces against a given strategic or operational objective; otherwise, he might fail in accomplishing the ultimate objective of a campaign or major operation. Because of the greater scale of the objectives, this process is much more difficult and time consuming than at the tactical level of command. In general, the larger the scope of the military objective is, the more the uncertainties that fall within the commander's estimate of the situation. The operational commander must have an uncanny ability to anticipate the enemy's reaction to his *own* actions and then make decisions to respond to the *enemy's* actions.

In contrast to a tactical commander, an operational commander needs to evaluate the features of the physical environment in operational rather than tactical terms. This means, among other things, assessing characteristics of geography, hydrography, and oceanography in terms of their effect on the course and outcome of a major operation and campaign, not on battles and engagements or some other tactical actions. The operational commander is also far more concerned with the effects of climate, rather than weather, on the employment of multiservice/multinational forces in a given part of the theater.

Thinking operationally means that the operational commander clearly sees how each of his decisions contributes to the ultimate strategic or operational objective. All the actions of the operational commander should be made within the given operational or strategic framework; otherwise, they will not contribute to ultimate success and might actually undermine it. As in a game of chess, the player who views the board as a single interrelated plane of action, with each move as a prelude to a series of further moves, is more likely to be successful than an opponent who thinks only a single move at a time. The operational commander should think how to create opportunities for employing his forces while at the same time reducing the enemy's future options.[39] One of the most important attributes of a higher commander is the ability to see the situation through the enemy's eyes—what Napoleon I called "seeing the other side of the hill." Largely, this ability is intuitive. Napoleon I and some other successful military leaders had an extraordinary ability to visualize what the enemy's commander would do in countering the movements of their own forces.[40]

A commander thinks operationally when he looks beyond the domain of physical combat and into the future. The greater one's sphere of command, the further ahead one should think.[41] By correctly anticipating the enemy's reaction to his own actions, the operational commander can make a sound and timely decision, counteract, and then prepare to make another decision to respond to the enemy's counteraction. The key to success is to operate within the enemy's decision cycle. Without this ability, the operational commander cannot seize and maintain the initiative—and without the initiative, his freedom of action will be restricted by the opponent.

The operational commander should also have the ability to evaluate the impact of new and future technologies on the conduct of operational warfare. He must not focus on specific weapons or weapon platforms and sensors but should anticipate the influence these will have on the conduct of campaigns or major operations when used in large numbers. Moltke was one such rare individual who understood the impact that the technological advances of his era, specifically the railroad and telegraph, would have on the conduct of war and campaigns. He emphasized the importance of railways in the movement of troops, especially in the mobilization and deployment phase of a campaign. He directed the drafting of the first mobilization plan and movement tables in 1859. He also paid attention to the analysis of military technical advances.[42] Field Marshal Alfred von Schlieffen (1833–1913) showed great enthusiasm for adopting new technologies. However, in contrast to Moltke, he lacked proper vision where future technical developments were concerned.[43]

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Closely linked to operational thinking is the commander's *operational vision*—that is, the ability to correctly envision the military conditions that will exist after the mission is accomplished. Operational vision is the practical application of operational thinking in planning, preparing, and executing a campaign or major operation. Hence, it is inherently narrower in its scope than operational thinking. In terms of time, it is also limited to the anticipated duration of a campaign or major operation. The commander's operational vision is expressed in his *intent* transmitted to subordinate tactical commanders. It is critical for success that the operational commander imparts his personal vision of victory and the conditions and methods for obtaining it to all subordinates. The commander's vision

is a combination of his personality traits, education and training, and experience. In general, the higher the level of command, the further into the future the commander must look to achieve and consolidate the desired combat success. And the larger the scope of the military objective, the more complex the situation and more difficult it is to correctly envision the military endstate and the unfolding of events leading to it.

Systems vs. Clausewitzian View of War

All the proponents of the systems approach, regardless of their differences, essentially share the mechanistic or Newtonian view of warfare. They believe that the information age is so different that the classical theory of war as explained by Clausewitz has become irrelevant. They clearly confuse the distinctions between the nature of war and character of war. *Nature of war* refers to constant, universal, and inherent qualities that ultimately define war throughout the ages, such as violence, chance, luck, friction, and uncertainty. Hence, the nature of war is timeless regardless of the changes in the political environment, the cause of a war, or technological advances.[44] *Character of war* refers to those transitory, circumstantial, and adaptive features that account for the different periods of warfare. They are primarily determined by sociopolitical and historical conditions in a certain era as well as technological advances. Systems approach advocates firmly believe that technology is the most important factor affecting both the nature and character of war. They view war as an open, distributed, nonlinear, and dynamic system. It is highly sensitive to initial conditions. It is characterized by complex hierarchical systems of feedback loops. Some of the loops are designed but others are not. Feedback results are invariably nonlinear.[45]

The Newtonian view of the world is that of a giant machine. Everything runs smoothly, precisely, and predictably. Everything is measurable.[46] Systems approach proponents suggest that all problems in warfare can be easily resolved and that military operations are immune to perturbations from their wider environment. All that is needed is for one's military machine to operate at peak efficiency; then victory is ensured. The neo-Newtonians believe the outcome of a war can be predicted. Hence, they put an extraordinary emphasis on quantifiable methods in measuring the progress and outcome of combat. They offer a clean concept of warfare, believing that a direct link can be established between cause and effect. Small causes lead to minor results, while decisive outcomes require massive inputs. The proportional connection can be established between each cause and effect.[47] War is considered a one-sided problem rather than an interaction between two animate forces. The enemy's actions or reactions can essentially be disregarded. In fact, because the enemy cannot be controlled, he is not considered a factor at all.[48] The neo-Newtonians acknowledge that uncertainties and friction existed in past wars. However, they contend that fog of war and friction in combat were caused by the inability to acquire and transmit information in real or near-real time.[49] Friction can be reduced to manageable levels by deploying a vast array of sensors and computers netted together.

A systems approach to warfare is not much different from the failed "geometrical" or "mathematical" school that dominated military thinking in Europe in the late 18th century, which Clausewitz vehemently opposed. Contrary to the views of many EBO proponents, the Prussian did not embrace the systems view of warfare. In fact, he ridiculed thinkers such as Dietrich Heinrich von Buelow (1757–1807), one of the leaders of the mathematical school, who took all moral values out of the theory and dealt only with materiel, reducing all warfare to a pair of mathematical equations of balance and superiority in time and space, and a pair of angles and lines.[50] Clausewitz was against any dogmatic way of thinking. Among other things, he commented that efforts were made to equip in order to conduct war with principles, rules, or even systems. The conduct of war in his view branches out in all directions and has no definite limits. Thus, "an irreconcilable conflict exists between this type of theory and actual practice."[51]

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Clausewitz insisted that the outcome of any war cannot be predicted with certainty because so many intangible elements come into play.[52] The art of war deals with living and moral forces. Thus, it cannot attain the absolute and must always leave a margin for uncertainty. The greater the gap between uncertainty on one hand, and courage and self-confidence on the other, the greater the margin left for accidents.[53]

Clausewitz wrote that war is not the action of a living force upon a lifeless mass but the collision of two living forces.[54] The enemy has his own will and can thus react unpredictably and even irrationally. Systems approach enthusiasts seem unaware that the timing and scope of irrationality cannot be predicted or measured. It is simply *unknowable*. Yet irrational decisions on either side can have significant consequences on both a course and an outcome. In general, one can presume that rational actors in a war make rational and proper choices when confronted with competing alternatives, each having a cost and payoff that are known or available to the actors.[55] However, the pervasive uncertainty in any war, the role of chance and pure luck, and the enemy's independent will and actions make rationality in the conduct of war a highly unrealistic expectation. A rational calculus, after all, is based on the notion that nations fight wars in pursuit of postwar objectives whose benefits exceed their cost. Benefits and costs are weighed throughout the war, and once the expenditures of effort exceed the scale of the political objective, the objective must be renounced and peace will follow.[56] The rationality of decisionmaking presupposes each side knows exactly what the changing objectives of the other side are and what those objectives are worth in effort and sacrifice. They each also have all the necessary information to evaluate the other side's intent to continue or cease fighting. Thus, one side or the other can precisely calculate the enemy's relative current and future strengths.

Also, one or both sides can identify and compare the anticipated costs of all available options.[57] Systems approach proponents acknowledge that war is rarely at equilibrium because of the combined influences from the physical environment and such intangible factors as politics, leadership, and information. They also acknowledge the effect of friction, fatigue, loss of morale, and poor leadership.[58] Yet they seemingly do not realize that the systems approach cannot predict, much less correctly measure, combined effects of friction, uncertainty, danger, fear, chance, and luck in the conduct of war. Clausewitz wrote that friction is the only concept that "more or less corresponds to the factors that distinguish real war from war on the paper."[59] In his view, "Actions in a war are like movement in a resistant element; in war it is difficult for normal

efforts to achieve even moderate results."[60] Friction consists of the infinite number of unforeseen things, large and small, that interfere with all activities in war.[61] It encompasses uncertainties, errors, accidents, technical difficulties, and the unforeseen, and their effects on decisions, morale, and actions.[62]

Clausewitz wrote that the military machine is basically simple and therefore easy to manage. Yet it is composed of many parts, and each part is composed of individuals. Each of these has the potential to generate friction. The ever-present factor of danger, combined with the physical exertions that war demands, compounds the problem. Friction is the factor that makes the apparently easy things in warfare so difficult.[63] Clausewitz wrote that the most serious source of friction in war is the difficulty of accurate recognition. This, in turn, makes things appear entirely different from what one expected. He also emphasized that friction in war cannot be reduced to a few points, as in mechanics. Friction is everywhere in contact with chance. It brings about "effects that cannot be measured—just because they are largely due to chance."[64]

Because combat is a clash of opposing wills, uncertainties and unknowns abound. This fog of war, when combined with friction, creates numerous ambiguities about which a commander must make decisions. The higher the level of war, the more uncertainties the situation encompasses. Chances of achieving surprise and deception increase as the fog of war increases. Clausewitz wrote that the only situation the commander knows fully is his own. He knows the enemy's situation only from unreliable information. Also, it is human nature either to underestimate or overestimate enemy strengths.[65] The effectiveness of military forces is reduced when decisions are made, as they often are, on the basis of imperfect, incomplete, or even false information. The fog of war is the main factor that makes some commanders willing to take high (but prudent) risks and others extremely cautious or deliberative in making decisions. The uncertainties and imperfections in the knowledge of the situation on which the commander bases his decisions and actions can never be fully mastered, regardless of one's advances in information technologies. Uncertainty in war is not only a result of a lack of information, but also often caused by what one does *not* comprehend in a given situation.

Despite some differences in emphasis, all systems enthusiasts share essentially the same views on warfare. They are neo-Newtonians because they view warfare as a machine. For them, the outcome of a war is quite predictable. Hence, they try to quantify both tangible and intangible elements in war. Systems advocates generally overemphasize the role and importance of technology. They also believe that despite difficulties, uncertainties in a situation can be reduced if not even eliminated. The factor of friction can be mastered. One can easily agree that systems theories can be successfully applied in analyzing many aspects of human activities—for example, the economy, business, organizations, and political system. However, it is a quite a stretch to apply such theory to warfare. War is not economic activity, and it is not a business (as it is widely believed to be in the U.S. military and elsewhere). No other human activity even distantly approaches war in complexity and unpredictability.

One can disagree with many ideas espoused by Clausewitz 180 years ago. Yet despite the passage of the time, his views on the nature of war, the relationship between policy and strategy, and the importance of moral and psychological factors in warfare are as valid today as they were then. Warfare has remained a domain full of uncertainties, friction, chance, luck, fear, danger, and irrationality. No advances in technology will ever change that. Finally, any new or emerging military theory, including the systems approach to warfare, must fully meet the test of reality. And if the theory conflicts with reality, then it must be modified, radically changed, or abandoned. **JFQ**

NOTES

[1] Robert M. Gates, remarks before the National Defense University, Washington, DC, September 29, 2008, available at <www.defenselink.mil/speeches/speech.aspx?speechid=1279>.

[2] Steven M. Rinaldi, *Beyond the Industrial Web: Economic Synergies and Targeting Methodologies* (Maxwell Air Force Base, AL: Air University Press, 1995), 7–8, 10. The U.S. military defines a *system* as a functionally, physically, or behaviorally related group of elements that interact together as a whole. See Joint Warfighting Center, Joint Doctrine Series, Pamphlet 7, *Operational Implications of Effects-based Operations* (EBO) (Norfolk, VA: U.S. Joint Forces Command, November 17, 2004), 2.

[3] Cited in Rinaldi, 1.

[4] Tami Davis Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914–1945* (Princeton: Princeton University Press, 2002), 163.

[5] Gary H. Cheek, "Effects-Based Operations: The End of Dominant Maneuver," in *Transformation Concepts for National Security in the 21st Century* (Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, September 2002), 82.

[6] J.P. Hunerwadel, "The Effects-Based Approach to Operations: Questions and Answers," *Air & Space Power Journal* (Spring 2006), 3, available at <www.airpower.maxwell.af.mil/airchronicles/apj/apj06/spr06/hunerwadel.html>.

[7] Cheek, 74.

[8] Steven M. Leonard, "The Elusive Silver Bullet: Effects in Army Operations," unpublished manuscript, March 27, 2007, 3–4.

[9] Christopher Bence, "Warden vs. Pape," *Air & Space Power Chronicles*, February 28, 2000, 2.

[10] John A. Warden III, "Thinking and Acting Strategically in Peace and War," in *Strategische Studien I: Strategische Denken in 21, Jahrhundert, MILAK Schrift*, no. 3 (Zurich: Militaerakademie an der ETH, 2006), 25.

[11] Dale C. Eikmeier, *The Center of Gravity Debate Resolved* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, December 16, 1998), 27.

[12] Warden uses this term now because he subsequently applied his model to the business world; the term *agent*, in his view, has a broader meaning and is somewhat preferable to *fielded forces*. See John A. Warden III, "Strategy and System Thinking," *Air Power Revue der Schweizer Armee*, no. 3, addendum to *AllgemeineSchweizerische Militaerische Zeitschrift*, December 12, 2004, 19–20.

[13] John A. Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 1 (Spring 1995), 11–12, available at <www.airpower.maxwell.af.mil/airchronicles/apj/apj95/spr95_files/warden.htm>.

[14] David A. Deptula, *Effects-Based Operations: Change in the Nature of Warfare* (Arlington, VA: Aerospace Education Foundation, 2001), 18.

[15] Lewis Ware, "Some Observations of the Enemy as a System," *Airpower Journal* (Winter 1995), 2, available at <www.airpower.maxwell.af.mil/airchronicles/apj/ware.html>.

[16] Joint Publication 5–0, *Joint Operation Planning* (Washington, DC: The Joint Staff, December 26, 2006), xv.

[17] Joint Warfighting Center, *Operational Implications*, 2.

[18] Joint Warfighting Center, *Commander's Handbook for an Effects-Based Approach to Joint Operations* (Norfolk, VA: U.S. Joint Forces Command, February 24, 2006), II–14.

[19] Ibid., II–3.

[20] Ibid.

[21] Ron Tira, *The Limitations of Standoff Firepower-Based Operations: On Standoff Warfare, Maneuver, and Decision* (Tel Aviv: Institute for National Strategic Studies, March 2007), 11–12.

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